2012 Snake River Fall Chinook Salmon Spawning Summary

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Fall Chinook salmon redd surveys were conducted cooperatively by biologists from the Idaho Power Company (IPC), Nez Perce Tribe (NPT), U.S. Fish and Wildlife Service (USFWS), and Washington Department of Fish and Wildlife (WDFW). This was the 25th year that intensive, cooperative aerial surveys have been conducted in the Snake River and most major tributaries above Lower Granite Dam and 21st year for ground surveys in tributaries downstream of Lower Granite Dam. Areas immediate below the four lower Snake River dams were not surveyed in 2012. A total of 4,795 redds were estimated in the Snake River Basin (Table 1), representing the third highest estimate since intensive surveys began in 1988. This years' redd estimate was 215 redds less than the second highest estimate last year and 835 redds less than the record estimate in 2010.

Table 1. Number of fall Chinook salmon redds in the Snake River Basin, 2012 (all aerial counts except as noted, N/S = no survey).

Survey Area	Number of Redds
Snake River (aerial and ground)	1,412
Snake River (underwater video)	416
Total Snake River	**1,828**
Clearwater River	1,610*
Potlatch River	283
N.F. Clearwater River	0
S.F. Clearwater River	41
M.F. Clearwater River	3
Selway River	20
Big Canyon Creek (ground count)	1
Total Clearwater River Subbasin*	**1,958**
Grande Ronde River	303
Wallowa River	1
Wenaha River	5
Joseph Creek (incidental observation)	4
Total Grande Ronde River Subbasin	**313**
Imnaha River	**85**
Salmon River	**34**
Tucannon River (ground count)*	**541**
Asotin Creek (ground count)	**30**
Alpowa Creek (ground count)	**6**
Below Lower Granite Dam	N/S
Below Little Goose Dam	N/S
Below Lower Monumental Dam	N/S
Below Ice Harbor Dam	N/S
Grand Total Snake River Basin	**4,795**

*estimated count, see text for methods.

Due to safety concerns and to reduce risks of conducting weekly flights, the number of aerial surveys has been reduced to three or four flights for the last three years in major spawning rivers.

During aerial, ground, and underwater video counts, IPC and USFWS staff observed a total of 1,828 redds in the mainstem Snake River (Table 1). Fall Chinook salmon aerial redd surveys along the mainstem Snake River were attempted bi-weekly during the spawning season, beginning on 22 October, and ending on 3 December. During the survey flight of 19 November, environmental conditions (very strong winds) caused the flight to be terminated at approximately RM188 (mouth of the Salmon River). On 20 November biologists returned to the air and were able to survey the remaining portion of the river from RM188 to Hells Canyon Dam (RM247). The final survey on 3 Dec was also concluded early, at RM228, again due to unsafe wind conditions. Of special note for this season was the fact that the water clarity between Asotin, WA and the Salmon River was poor throughout the season, and wind conditions in the upper canyon were the worst ever experienced during 21 years of surveys. The flows from the Hells Canyon Dam were maintained stable at approximately 9,400 cfs from 8 October through 8 November. The stable flow was reduced to 8,900 cfs on 8 November, and remained at that level through 4 December. Biologists assessed the potential of dewatering redds when the stable flow was reduced, and found that none were affected. The aerial surveys attempted to cover the river corridor between Asotin, Washington, and the Hells Canyon Dam (approximately 100 river miles). Throughout the season, visibility during aerial surveys was generally poor in the river section between Asotin, WA and the mouth of the Salmon River (due to very turbid conditions), but good to excellent upstream of the Salmon River, to the Hells Canyon Dam. Intensive deepwater spawning searches were conducted throughout the main river corridor, using remote underwater video cameras, in areas too deep to be viewed from the air. The deepwater searches began in mid-November, and were completed in early December. Spawning was estimated to have begun during mid-October (33 redds observed on 22 October), appeared to peak in early November (942 new redds observed on 5 November), and was determined to be complete by early December (25 new redds observed on 3 December, the final survey). Approximately 71% of redds observed during aerial surveys were constructed by 5 November. During aerial surveys we observed a total of 1,375 redds, constructed at 107 distinct spawning locations. An additional 37 redds were noted at three shallow water sites during more comprehensive ground counts. The deepwater searches located an additional 416 redds at 33 sites. For 2012 the total redd count for the Snake River was 1,828. Since 2008, the mean number of redds occurring in the Snake River (including deep water counts) has been 2,300, ranging between 1,819 and 2,944. The lowest redd count for the Snake River, since intensive, cooperative surveys began, was 46 redds in 1991, while the highest count was 2,944 redds in 2010.

A new technique for counting, and estimating shallow redds, using an unmanned air system (UAS) was tested during the fall of 2011, and continued to be tested during 2012. After excellent results during the 2011 season, the FAA requested that IPC biologists cease flights with the UAS, unless proper authority was obtained from their office. While it proved impractical for either IPC or the NPT to obtain the proper authority, it was possible to contract with the University of Alaska, Poker Flats Research Range, to continue UAS surveys. Similar to last year, we used a small remote controlled aerial drone (Aeryon Scout; quadrocopter), equipped with a digital camera, to capture images at index areas within both the Snake and Clearwater rivers. A set of 31 index areas were selected on the Snake River, and 13 were selected for the

Clearwater River. Index areas were selected based on advice from the department of statistics at the University of Idaho. Each area was scheduled to be flown once per week throughout the spawning season; however, logistical and technical difficulties prevented us from consistently flying each site, especially on the Clearwater River. As in 2011, flights were able to be conducted, and useable still photographs were collected, even under adverse conditions of strong wind, which would have otherwise resulted in cancelling a traditional helicopter survey due to safety. Preliminary assessment of the photographic data clearly shows redds (as well as fish) throughout each area. A final count, comparison with biologists "eyes in the skies", and a total estimate of shallow redds, based on the photographic data, will be forthcoming. However, even given the difficulties encountered during the 2012 season, the use of a UAS for ultimate data collection continues to be a clear success, and we maintain that this type of technology be adapted for future use, in lieu of helicopter surveys, based on safety and cost.

As previously mentioned, the use of the Aeryon Scout (AS) was successful; however, certain difficulties arose throughout the season, many of which could have been prevented with better pre-season flight preparation and planning. First of all, while the AS is very easy to program and fly (and is very robust in its design), it is much more expensive to purchase (>$50,000 each) than the hexacopters that were used during the 2011 season (<$10,000 each). The AS is fully programmable and is easy to fly. It takes off, flies preset waypoints at a set elevation, speed and orientation, and returns to its "home position" and lands (given the right terrain), on its own. However, the AS is absolutely dependant on acquiring a solid GPS signal in order to start its motors, which can be difficult to obtain in a deep canyon such as on the Snake River. This made it impossible to fly certain areas that had initially been chosen. We had no difficulty flying the AS when wind conditions were strong and gusty, or during periods of light rain. However, the onboard camera system draws power from the AS main battery and there is a programmed failsafe that shuts the camera off to reserve dedicated power for flight and navigation during periods of increased power demand. This occurred when wind conditions were strong and gusty, and would not have necessarily been detrimental. However, when the high power demand ceases, the AS does not restart the camera. Instead, it has to be landed, the systems reinitialized, and then the AS can be restarted. This type of operation tended to waste considerable time, and ultimately interfered with our ability to obtain good flight coverage of the sites. The AS is normally capable of collecting both high resolution photographs and video simultaneously; however, technical problems disabled the video capture. Because each photograph is geo-referenced, we expected that it would be possible to construct photo-mosaics for each site, for each week, facilitating redd counts. However, after attempting this, it was realized that because the photographs were taken over moving water, and stationary landmarks were not present, it was not possible to have computer software create the photo-mosaics. It is still possible to stitch individual photographs together by eye, but this has proved to be a tedious project. While specific problems did arise throughout the season, we were able to work through them and develop a streamlined protocol. We expect that future use of a UAS (whether the AS or our original hexacopter) will easily accomplish our program goals. There is no doubt that the cameras (video or still) onboard a UAS can capture the imagery necessary to identify and enumerate redds. And we are learning that these types of images will be crucial in identifying and making sense of redd superimposition.

During aerial and ground surveys, NPT staff estimated a total of 1,958 redds in the Clearwater River Subbasin (Table 1). The mainstem Clearwater River was an estimated count, since no count could be conducted after 8 November due to persistent rains and turbid water. There were 210 redds observed during the first survey on 17 October in the lower Clearwater and 908 new redds observed on 8 November for a total of 1,118 redds counted. To estimate redds missed on the Clearwater, we averaged the previous 5 years counts up to 8 November and got a percentage of the overall total of redds counted to that date (0.6942), then applied that percentage to 1,118 to get an estimate of 1,610 redds, or 492 redds missed. We believe this is a conservative estimate since conditions were only "good" on 8 November and redds in deep water spawning areas were difficult or impossible to see. Additionally in 2010, conditions were only "fair" on the last of three surveys when a number of redds were thought to be missed but not estimated, which tends to bias low this years' estimated redd number. Redd searches covered the entire Clearwater River from the Clearwater Paper Mill in Lewiston, Idaho to the forks of the South Fork and Middle Fork Clearwater rivers (approximately 71 miles), lower Potlatch River (10 miles), about one half mile of the lower North Fork Clearwater River below Dworshak Dam, the entire Middle Fork Clearwater River (22 miles), lower South Fork Clearwater River (14 miles), and lower Selway River (19 miles). We also conducted one ground survey 27 November on the lower one mile of Big Canyon Creek. Aerial surveys on the Potlatch and the N.F. Clearwater rivers were on the same days as the lower Clearwater, 17 October and 8 November. No redds were observed on the first survey in Potlatch River and 283 redds counted on 8 November. This was a record count on Potlatch River surpassing the 2010 record count by two redds. We believe redds were missed in the Potlatch River since we were not able to survey after 8 November and redds are typically hard to see and count from the air. Rains and turbid water also prevented a ground count and collection of numerous (>200) carcasses observed on the 8 November aerial survey. No redds were observed in the N.F. Clearwater River on either survey. This was the first time we surveyed Big Canyon Creek and one redd was observed about 0.5 miles upstream of the mouth. The upper Clearwater (from Orofino Creek upstream to the M.F. Clearwater), the S.F. Clearwater, M.F. Clearwater, and the Selway rivers were surveyed on 22 October and 14 November. Survey counts were 0 and 37 redds in the Clearwater, 1 and 40 redds for the S.F. Clearwater, 2 and 1 redds for the M.F. Clearwater, and 3 and 17 redds for the Selway rivers, respectively, for the two survey dates. Survey conditions were fair and excellent on the two upriver survey dates, respectively, then deteriorated for the last scheduled 26 November survey which was not conducted. A few redds were likely missed in the upper Clearwater River Subbasin as well but not as many as estimated missed in the lower river. Since upriver Clearwater River redds are usually a much smaller fraction of the overall Clearwater Subbasin count, redds missed were not estimated. During the fall Chinook spawning period, Dworshak Reservoir discharges remained stable at 1,600 cfs. Flows on the lower Clearwater (USGS Gauging Station at Spalding, ID) were slightly higher than normal on both surveys (4,810 and 5,100 cfs), then fluctuated throughout the rest of the season but water clarity remained poor because of frequent rains. Even though a last scheduled redd survey was not conducted in the upper Clearwater Subbasin, the total counts of 41 and 20 redds observed in the S.F. Clearwater and Selway rivers were record counts since recent surveys began. In Lapwai Creek, the NPT coho staff constructed a coho weir just above the mouth and collected a total of 299 fall Chinook. They released 91 (7 females) above the weir, 148 (11 females) downstream of the weir, and 60 (7 females) back to the Clearwater River. There was not an attempt to discern coho from Chinook redds observed in Lapwai Creek. Every year, we continue to observe redds in new

spawning locations throughout the Clearwater Subbasin. During 2012, we observed redds in areas on the S.F. Clearwater, M.F. Clearwater, and the Selway rivers where no redds had been previously recorded. Since 2008, the mean number of redds occurring in the Clearwater River Subbasin has been 1,533 ranging between 965 and 1,958. The lowest redd count for the Clearwater River Subbasin, since intensive surveys began was 4 redds in both 1990 and 1991, while the highest count (estimated) was 1,958 redds in 2012.

A total of four aerial surveys conducted by NPT staff on the Grande Ronde River resulted in a total of 303 redds observed (Table 1). Surveys on 17 October, 5 November, and 28 November resulted in 2, 262, and 20 new redds counted, respectively, with 19 redds counted in an extended survey conducted on 15 November. Redd surveys covered the mouth up to the Wildcat Bridge past the town of Troy (53 miles). The extended area covered the Grande Ronde from Wildcat Bridge up to the Wallowa River (29 miles), lower Wallowa River (5 miles), and lower Wenaha River (6.5 miles). A total of one redd was observed in the Wallowa and 5 redds observed in the Wenaha. The NPT steelhead project staff observed 4 redds attributed to fall Chinook in Joseph Creek about 1-2 miles above the mouth and collected 5 fall Chinook carcasses. On the mainstem Grande Ronde, redds were seen in 68 distinct spawning locations. Survey conditions were fair on the first two surveys and good during the last surveys, therefore only a few deep water redds may have been missed. Flows were slightly higher than last year and ranged between 1,030 and 1,290 cfs (USGS Gauging Station at Troy, OR). Since 2008, the mean number of redds counted in the Grande Ronde River Subbasin has been 203, ranging from 101 to 313. The lowest redd count for the Grande Ronde Subbasin since intensive surveys began, was zero in 1989 and 1991, while the highest count was 313 in 2012.

A total of three aerial surveys conducted by NPT staff on the Imnaha River resulted in a total of 85 redds observed (Table 1). Surveys on 17 October, 5 November, and 28 November resulted in 1, 79, and 5 new redds counted, respectively. Surveys were conducted from the mouth up to the town of Imnaha (19 miles). Flows during surveys ranged from 150 to 208 cfs (USGS Gauging Station at Imnaha, OR). Survey conditions were good on the first two surveys and excellent on the last survey resulting in a good final count. Since 2008, the mean number of redds observed in the Imnaha River has been 69, ranging from 24 to 132. The lowest redd count for the Imnaha River, since intensive surveys began was zero redds in 1994, while the highest count was 132 in 2010.

One aerial survey conducted 14 November by NPT staff on the Salmon River resulted in 34 redds observed (Table 1). A survey scheduled 7 November was not conducted because of inclement weather. Rains and turbid water caused the last survey scheduled 29 November to be cancelled. The one survey was conducted from the mouth up to French Creek (105 miles). No additional surveys were conducted on the Salmon River from French Creek up to the S.F. Salmon River nor the lower S.F. Salmon as was done in 2011 where no redds were observed. Salmon River flow was moderate at 4,590 cfs during the survey and conditions were only fair, therefore, a number of redds were probably missed, especially deep water redds. Since 2008, the mean number of redds occurring in the Salmon River has been 30, ranging between 8 and 60. The lowest redd count for the Salmon River, since intensive surveys began in 1992, was zero redds in both 1999 and 2000, while the highest count was 60 in 2011.

The lower one quarter mile (mouth to old Hwy 12 Bridge) of Alpowa Creek was surveyed from the ground on 27 November by NPT staff who observed 6 fall Chinook redds and about a dozen live fish. This is the third year NPT staff have looked for redds in Alpowa Creek. A total of 31 redds were observed in the lower Alpowa Creek in 2010 while no redds were see in 2011. Similar to Potlatch River in 2010 and 2012, possibly higher flow conditions that prevailed in Alpowa Creek encourages fish to enter and spawn unlike low water years such as 2011.

WDFW staff surveyed 57% of the lower 20 miles of the Tucannon River from 8 October until 16 November when high flows curtailed surveys. Sections with restricted access were estimated using counts from adjacent sections. On average, 44% of the total number of redds are constructed prior to 16 November, based on data from 2011, 2010, 2009, and 2007. In 2012, staff counted 256 fall Chinook redds which expand to 541 after all adjustments were made (Table 1). The first redds were observed on 8 October and the peak of spawning occurred during the week of 5 November. Prior to the high flow events, visibility was excellent due to low flows. Since 2008, the mean number of redds in the Tucannon was 334, ranging from 252 to 541. The lowest redd count for the Tucannon River was 16 redds in 1987 and the highest estimate was 541 redds in 2012.

WDFW staff counted 30 redds in the lower 3.1 miles of Asotin Creek from Cloverland Bridge to the mouth (Table 1). The first survey was walked on 31 October and ceased on 15 November. The peak of spawning occurred during the week of 7 November.

No surveys were funded to conduct deepwater video redd surveys at the lower Snake River dams during 2012.

Final results will be provided in annual reports to Bonneville Power Administration. Past reports can be found at www.bpa.gov.